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Question 5 Ans

Integrate the following with respect to their variables.

(1) $x^{1/2} \ln x$

Solu. : let $u = \ln x$ & $dv = x^{1/2}$

∴ Using the formular $\int u\,dv = uv - \int v\,du$

Let $\frac{du}{dx} \times \frac{1}{x}$: $\frac{dux}{x} = \frac{dx}{x}$ ∴ $du = \frac{dx}{x}$

then $\int dv = \frac{2x^{3/2}}{3}$ ∴ $v = \frac{2x^{3/2}}{3}$

$\int x^{1/2} \ln x = \ln x \cdot \frac{2x^{3/2}}{3} - \int \frac{2x^{3/2}}{3} \cdot \frac{1}{x}\,dx$ | $u = \ln x$ $v = \frac{2x^{3/2}}{3}$ $dv = x^{1/2}$ $du = \frac{dx}{x}$

$= \frac{2x^{3/2}\ln x}{3} - \int \frac{2x^{3/2}}{3}\,dx = \int \frac{2x^{1/2}}{3}\,dx = \frac{2x^{1/2+1}}{3(1/2+1)} = \frac{2x^{3/2}}{3(3/2)} = \frac{2x^{3/2}}{9/2} = \frac{4x^{3/2}}{9}$

∴ $= \int x^{1/2} \ln x\,dx = \frac{2x^{3/2}}{3} - \frac{4x^{3/2}}{9} + C$

(2)

$\int 2 \cos 6t \cos t$. Sow

$2\int \cos 6t \cos t = \frac{1}{2}[\cos(6t+t) + \cos(6t-t)]$

$= \frac{1}{2}\cos 7t + \cos 5t$

$2 \times \frac{1}{2} \int \cos 7t + \cos 5t$

$1\left[\frac{\sin 7t}{7} + \frac{\sin 5t}{5}\right] + C$

∴ $\frac{\sin 7t}{7} + \frac{\sin 5t}{5} + C_4$

(3)

$\int \sin^3 x \cos^4 x \, dx$

Solu

$u = \cos x \quad \therefore \frac{du}{dx} = -\sin x \Rightarrow dx = \frac{-du}{\sin x}$

$\sin^2 x + \cos^2 = 1$

$\sin^2 x = 1 - \cos^2 x$

$= \int \sin x \cdot \sin^2 x \cdot u^4 x \cdot \frac{-du}{\sin x}$

$= \int \sin^2 x \cdot u^4 \cdot du.$

$= -\int \sin^2 x \cdot u^4 \, du.$

$= -\int (1 - \cos^2 x) \cdot u^4 \, du.$

$= -\int (1 - u^2) u^4 \, du$

$= \int (u^2 - 1) u^4 \, du$

$= \int (u^6 - u^7) \, du.$

$= \frac{u^7}{7} - \frac{u^5}{5} + C \qquad = \frac{(\cos x)^7}{7} - \frac{(\cos x)^5}{5} + C$